

WHAT IS CLAIMED IS:

1. A plasma processing apparatus comprising:

5 a vacuum chamber in which predetermined processing is to be applied on a substrate to be processed by action of plasma on the substrate to be processed, inside of the vacuum chamber being airtightly closable;

a bottom electrode provided in said vacuum chamber and configured to have the substrate to be processed placed thereon;

10 a top electrode provided to face said bottom electrode;

a processing gas supply mechanism configured to supply predetermined processing gas into said vacuum chamber;

15 a first radio-frequency power source configured to supply a radio-frequency power with a predetermined first frequency to said bottom electrode;

a second radio-frequency power source configured to supply to said bottom electrode a radio-frequency power with a second frequency that is lower than the first frequency;

20 a first power feeder having a first matching device that performs impedance matching for the radio-frequency power to be supplied to said bottom electrode from said first radio-frequency power source, said first power feeder being configured to feed the radio-frequency power with the first frequency to said bottom electrode from a center portion of said bottom electrode; and

25 a second power feeder having a second matching device that is structured as a separate body from said first matching device and performs impedance matching for the radio-frequency power to be supplied to said bottom electrode from said second radio-

frequency power source, said second power feeder being configured to feed the radio-frequency power with the second frequency to said bottom electrode from an outer peripheral portion of said bottom electrode.

5           2. A plasma processing apparatus as set forth in claim 1, wherein said bottom electrode is supported on an insulator plate formed in a plate shape, and a space is formed between the insulator plate and a bottom portion of said vacuum chamber that is set to a ground potential.

10           3. A plasma processing apparatus as set forth in claim 2, wherein said first matching device is disposed in the space.

          4. A plasma processing apparatus as set forth in any of claims 1 to 3,

          wherein said first matching device is electrically connected to said bottom electrode via a non-coaxially structured feeding rod.

15           5. A plasma processing apparatus as set forth in any of claims 1 to 4,

          wherein the first frequency is 13.56 MHz to 150 MHz.

          6. A plasma processing apparatus as set forth in any of claims 1 to 5,

          wherein the second frequency is 0.5 MHz to 13.56 MHz.

20           7. A plasma processing apparatus as set forth in any of claims 1 to 6,

          wherein capacitance of said bottom electrode is set to 50 pF or less.

          8. A plasma processing apparatus as set forth in any of claims 1 to 7,

          wherein the substrate to be processed is etched by the action

of the plasma on the substrate to be processed.